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## PATENT SPECIFICATION

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### COMPLETE SPECIFICATION

#### Process for the Production of Dental Crowns of Porcelain or other Ceramic Materials

I, EUGEN BRILL, a German citizen. of Unter den Linden 29, Berlin, Germany, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a process for the production of dental crowns of porcelain or other ceramic material.

The process hitherto adopted in making dental crowns comprises the following steps:—

a. An impression is taken of the suitably prepared tooth-stump by means of a plastic substance appropriately enclosed in a metal casing.

b. This impression thus taken is filled with amalgam or cement. After setting and removal, the amalgam or cement forms an exact model of the tooth-stump. The amalgam takes 24 hours to set: and the cement from 2 to 3 hours.

c. The amalgam or cement model is covered with platinum foil or platinum-iridium foil .02 mm in thickness; the latter is then polished and smoothed down, it being necessary to ensure that the sealing edge of the metal foil is joined as smoothly as possible to the step (viz. the junction of the stump and the root).

d. The platinum foil reproduction of the model thus obtained is then pulled off the model stump with great care in order to avoid deformation.

e. Porcelain composition of the known type prepared with water or alcohol is then applied in the known manner in a thin layer to the jacket of the metal model casing, and baked in the oven at a temperature of from 1200° to 1350°C. The application and baking of the porcelain compositions is repeated a sufficient number of times until the desired thickness and shape of the jacket crown is obtained.

f. The metal foil is now removed from the baked artificial crown and the latter connected to the tooth-stump in the patient's mouth.

This known process presents the disadvantages; first in the time required for

carrying it out, and secondly, in view of the great care called for in carrying it out, particularly when applying the raw porcelain composition to the metal foil shape, and finally by reason of the fact that the hollow part of the crown corresponding to the stump does not exactly correspond to the tooth-stump, but differs from it by at least the thickness of the metal foil shape, which is in fact approximately .02 mm., with the result that a considerable quantity of connecting cement is required for connecting to the tooth-stump the crown so produced. If, in the course of time, this connecting cement deteriorates or partially dissolves under the action of the saliva, then the jacket will no longer fit tightly upon the tooth-stump. Decay may start in the tooth-stump, thereby exposed, and, moreover, the delicate porcelain crown, which then no longer fits the tooth-stump on all sides, may break under the stress exerted upon it by mastication.

The process forming the object of the present invention eliminates these defects, and by its aid it is possible to reduce the time necessary for the production of a crown made of porcelain or ceramic composition to such an extent that a crown of this kind may be made in the course of a single visit by the patient.

The crown which is made in accordance with the process according to this invention has a cavity which corresponds exactly to the ground tooth-stump, so that it is possible to fix it tightly on to the said stump with quite a small quantity of cement and definitely prevent the subsequent exposure of the stump due to the dissolution of the connection cement.

The process is as follows:—

The impression is taken in the usual manner after which a thin stirred bedding mass of constant volume, a mixture of alumina, silicic acid and sulphate of lime, with the addition of a solution of a metallic salt which has a colouring action and renders the surface of the stump particularly smooth and dense, such as, for instance, platinic chloride, palladium,

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iridium or gold chloride or other salt of a metal having a melting point which is higher than the melting point of the porcelain paste to be used, is placed in the negative mould of the tooth-stump formed of plastic composition in the usual manner.

The following proportions of the various ingredients have been found to give very satisfactory results.

Alumina ( $Al_2O_3$ ) .....	50%
Silicic Acid ( $SiO_2$ ) .....	16%
Sulphate of lime .....	33%
Metallic Salt Solution ...	1%

The concentration of the metallic salt in solution is from 1 to 2%.

The mass is of constant volume between ordinary temperatures and the temperature of baking, viz. 1200°-1350°C.

Prior to the setting of this composition, which will take place within a short time, for example, within from 10 to 15 minutes, a core consisting of a high-temperature-resisting composition, for example, corundum, is pressed into the bedding mass in the mould by means of an extension serving as a handle for the subsequent model. After the hardening of the bedding mass, the latter is taken, with the core, out of the mould, this being done after the plastic composition of the negative mould has been rendered sufficiently soft by heat. Thus, an exact reproduction of the stump of the tooth previously prepared has been obtained by a series of rapidly effected operations from a hard high-temperature-resisting composition of constant volume even in high temperatures, with an inserted core which facilitates handling.

The steps *c* and *d* of the old process are eliminated.

The further process corresponds to stage *c* of the old process, that is to say, the application of raw porcelain layers to the model of the stump produced in accordance with step *b*, and the subsequent baking; however, and this again is essential to the progress offered by the process in accordance with the invention, there are not so many raw porcelain layers and subsequent bakings required as in the case of the old process because the shrinking during baking of the raw porcelain composition or other ceramic composition applied to the stump is, according to the invention, less than the shrinking on the metal positive of the stump. In this respect, too, there is a considerable saving of time in the production of the crown from porcelain or ceramic composition.

After the crown is annealed, it, together with the positive, is placed in water. The sulphate of lime in the embedding sub-

stances softens and the crown can be removed. Any adherent material may be brushed with a moist brush.

In addition to the considerable reduction in the time occupied by the production of a crown in accordance with the process of the invention and the advantage already mentioned, that the hollow in the crown corresponds exactly to the prepared tooth-stump in the mouth, there is the further advantage, important in manipulation, that the colouring of the exact model of the tooth-stump formed of bedding mass of constant volume sharply contracts with the core of corundum or the like, inserted into the model (owing to the admixture of the solution of the metallic salt with the bedding mass). This facilitates the exact application of the porcelain or ceramic composition from which the crown is to be made down to the sharp extension to the edge of the root.

The further value of the inclusion of a metallic salt in the bedding mass consists in the fact that the surface of same is thereby rendered extremely smooth and dense, which is of great importance in the production of a jacket crown possessing a hollow exactly corresponding to the tooth-stump in the mouth.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

A process for the production of dental crowns of porcelain or other ceramic compositions, in which, by means of an impression, a positive is taken of a stump of a tooth, which positive serves as a receiving core for the raw porcelain composition from which the crown is to be made by repeated application and baking, characterized in that a mass of constant volume between ordinary temperatures and the temperature of baking, viz. 1200°-1350°C, and consisting of alumina, silicic acid, and sulphate of lime with the admixture of a solution of a metallic salt, for example platinic-chloride or other salt of a metal having a melting point which is higher than the melting point of the porcelain paste to be used, is placed in a negative mould of the tooth-stump, this mould being made of plastic material, whereupon a core made of high-temperature-resisting material, for instance, corundum, is inserted in this mass which has not yet set, and by means of this model the crown is then made by the application and baking of porcelain or other ceramic compositions.

Dated this 8th day of March, 1934.

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Agents for the Applicant.